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# Telephony

FOR TODAY'S COMPETITIVE PUBLIC NETWORK MARKET

*Trying to fit ISDN into the the network of the future has become a perplexing task. The technology hasn't lived up to the fanfare that preceded it, but it still has a place in the network scheme of things. Cover photo by Phil Jason, Tony Stone Worldwide*

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# Putting together the pieces of the ISDN puzzle

JOHN WILLIAMSON, International Editor

Although the narrowband integrated services digital network has consistently failed to live up to the promises of its architects, the word on the street is that it is a big mistake to write the technology off. At the same time, though, hardly anyone now sees ISDN as the universal, all-purpose digital network of the future.

Devised in the 1970s and progressively standardized throughout the subsequent decade, ISDN has been hyped up by some and flatly dismissed by others.

Given ISDN's failure to remotely approach original installation targets or make any serious commercial headway in the 1980s, skeptics have tended to have the stronger argument so far. In this context, a new report from the International Telecommunications Users Group (Intug) notes that less than 20% of International Telecommunication Union members plan to implement ISDN, and the other 80% is "largely ambivalent or hostile."

Analyses of what went wrong are not in short supply, and there is general consensus on the main reasons why ISDN growth has been inhibited.

## Tell Me Why

Those reasons include lack of user awareness and applications, the incomplete nature of the applicable standards, the absence of customer premises equipment in quantity, and unattractive or confusing tariff structures.

The first of these is perhaps the most important. "There is no clearly focused, widely shared, vision of the applicability of ISDN among potential users" says the Intug report.

Although the telecom industry's familiarity with ISDN may be on the verge of breeding contempt, the vast majority of would-be customers apparently are ignorant of the technology and its advantages. "There is still a lot of education to do on the benefits of ISDN. People in the industry understand it, but customers don't necessarily," says Grace Blackburn, manager of Mercury's new Switchband international dial-up, bandwidth-on-demand service.

Bandwidth-on-demand, which some observers see as having a negative impact on the market for ISDN in the longer term, appears to be better understood. A Mercury poll found that 73% of respondents were interested in the Switchband offering.

Another problem for ISDN is that, despite all the hyperbole, it does not neatly fill a vacuum in the marketplace. "A new network in general always presents a problem if it doesn't replace an existing network," notes Hans Baur, executive vice president of Siemens.

Meanwhile, since international and multinational enterprises are likely to feature prominently in the first wave of ISDN consumers, slow progress toward the interconnection of national services has not been helpful. British Telecom claims the world record among operators, with international ISDN connections to 14 countries and 24 networks.

"Interconnection of ISDN internationally, also nationally to pre-ISDN voice and data networks, is of great importance to users, especially in the migration period. This important aspect seems not to be getting the attention it deserves," notes the Intug report.

Initial responses to the latest European Commission scheme to

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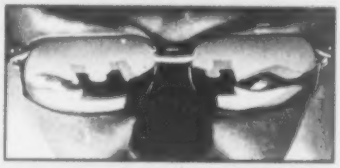
*Although the telecom industry's familiarity with ISDN may be on the verge of breeding contempt, the vast majority of would-be customers apparently are ignorant of the technology and its advantages.*

# Developing secure systems

**VIRGINIA LACKER**

With the emergence of ISDN standards, vendors and users have changed their approach toward telecommunications. The integrated services digital network provides users with access to voice, data, image, video and multimedia applications. The "user" may be a human or an application process. Providing security to these diverse users, processes and applications as they migrate to a single network is a significant challenge.



ISDN security solutions must account for every imaginable type of call including voice, data, circuit-switched and packet-switched. It also must handle basic rate interface (2B+D) and primary rate interface (23B+D).

Messaging systems such as voice mail and electronic mail require separate networks and terminals. Each system provides its own security safeguards tailored for its community of users. In many cases, access is restricted to local users. If a single community of users is dispersed to several locations in a campus or field-office arrangement, they must often maintain separate systems at each location or maintain costly private leased lines between locations.

With ISDN, these two previously separate and isolated applications can be integrated and centralized. A single integrated messaging system replaces multiple voice mail and E-mail systems and also supports facsimile and video messages. This centralized system serves multiple communities of users at many locations. Since remote access is allowed on a dial-up basis, many remote users who were previously unable to access the system may also be served.

To accomplish this integration of services, more information about the calling party, called party and the nature of the call must be transported through the network. This information must be safeguarded against unauthorized users and the number and diversity of users that have access to the single system also must greatly increase. There are concerns over legitimate users of one part of the system gaining unauthorized access to other parts of the system.

ISDN developers need to demonstrate the ability to provide security services for applications that bridge multiple networks. The applications must exchange data easily across different network administrations and different vendors' equipment with no loss of functionality, no apparent distinction to the end users and no increased risk to the security of the data.

The methods of securing ISDN include centralizing ISDN application processors, and locating conference bridges and message storage and retrieval systems at a secure site that would be accessible through a secure switch. Issues involving confidentiality could be provided by the use of crypto equipment on end user devices and at the network access point of the secure switch. Data integrity should be addressed within each application. Although ISDN security is a serious problem, there are serious solutions.

Viginia Lacker is Engineering and Standards Representive at Harris DTS, Novato, Calif.



establish a commercial regional ISDN service by 1993 suggest that an improvement in this situation will not be easy. Reportedly, the largest operators believe the EC timetable is unrealistic and do not believe that tariffs readily can be made cost-based as required by the EC plan. There also is operator resistance to the idea of providing service before identified market demand and an unwillingness to relinquish control of national numbering plans.

Despite all this, the pieces of the ISDN puzzle seem to be falling into place.

Observers such as Robert Mitro, PictureTel's vice president of sales and marketing, detect a new urgency in the marketplace. On a recent videoconferencing demonstration tour of Europe, for example, Mitro was able to get Deutsche Bundespost Telekom to run ISDN lines into a hotel in a matter of days, rather than months. "A significant transition has taken place in the last four to six months," argues Mitro. "ISDN is now ready in Europe, in our opinion."

This view is supported by the 1991 European ISDN Atlas published last month by the Ovum consultancy on behalf of the EC and in association with Fischer & Lorenz. The atlas predicts that ISDN will be available to all business users in five EC countries by the end of 1993. By 1995, it will be available throughout eight EC countries and to more than 60% of users in four other countries. Counting each primary access as equivalent to 10 basic accesses, the atlas forecasts 380,000 basic ISDN access equivalents in use in the EC by early 1994, 2.4 million by 1997 and 11.2 million by the decade's end.

*...the largest operators believe the EC timetable is unrealistic and do not believe that tariffs readily can be made cost-based as required by the EC plan.*

Further afield the mood also is upbeat. At the recent Telecom 91 exposition in Geneva, a senior Nippon Telegraph and Telephone Corp. executive forecast that as many as 70,000 ISDN lines could be in use in Japan by 1992 and that by the year 2005, 20 million lines out of the country's 70 million will be ISDN.

## Brighter Prospects

There are a number of reasons for the turnaround in the fortune of ISDN.

As Siemens' Baur points out, digital exchanges are now installed in great numbers in public networks and the ownership of personal computers is approaching the ubiquity of some types of consumer electronic products. Digital central offices and PCs are two natural elements in the ISDN chain.

ISDN terminals and terminal adapters also are appearing in greater numbers. A new example is the Digidial range of terminal adapters being launched

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later this year by U.K. data communications vendor Jaguar. The Digidial card changes a conventional PC into an ISDN workstation, combining speech and data over one or two 64-kb/s channels.

The company also will debut a Digidial modem at the upcoming U.K. Telecommunications Managers Association conference. As well as accessing 64-kb/s ISDN lines, this device can connect across the ISDN to any V.32 modem operating on the public network.

Sometimes terminal equipment manufacturers are assisted in bringing products to market by the local carrier.

Singapore Telecom, which started the world's first nationwide commercial ISDN service in 1989, has formed a partnership with the research arm of Singapore's National Computer Board and the private sector company Ssangyong Cement to develop an ISDN adapter card. It is intended to allow a PC connected to ISDN circuits to be used simultaneously for videoconferencing and multimedia transmission such as voice, data and image.

British Telecom is making facilities at its Research and Technology Laboratory available to companies to test their products for compatibility with the BT ISDN network, for interworking with other ISDN equipment, and for operability over international links. BT also is helping ISDN manufacturers gain formal U.K. network connection approval. Les Lowin, BT's ISDN marketing manager, expects the number of BT basic rate ISDN lines available in the U.K. to reach 90,000 by April 1991.

*The success of fast packet switching systems such as frame relay will depend on the service quality and tariffs offered by service providers. . . .*

In the same way, more ISDN applications are presenting themselves. International videoconferencing is one, and the appearance of low-cost, dial-up, low-bandwidth systems is expected to fuel demand for international ISDN connections. PictureTel's Mitro believes that by 1995, low-bandwidth videoconferencing at 64 kb/s or 128 kb/s will constitute more than 90% of the market.

"That implies ISDN," argues Mitro. "Videoconferencing is the natural application for ISDN. It's the best way for the operators to exploit their infrastructure investments."

The effort already devoted to the development and standardization of narrowband ISDN, and the under-

*continued on page 50*

| | | | Bearer services | | Supplementary services | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ISDN basic access | ISDN primary access | 64-kb/s unrestricted | 3.1-kHz audio | Calling line identification presentation (CLIP) | Calling line identification restriction (CLIR) | Direct dialing in (DDI) | Multiple subscriber number (MSN) | Terminal portability (TP) |
| Belgium | 1992 (1989) | 1992 (1989) | 1992 (1989) | 1992 (1989) | 1992 (1989) | 1992 (1989) | 1992 (1989) | 1992 | 1992 |
| Denmark | 1992 | 1992 | 1992 | 1992 | 1992 | 1992 | 1992 | 1992 | 1992 |
| France | 1993 (1987) | 1993 (1989) | 1993 (1987) | 1993 (1987) | 1993 (1987) | 1993 (1987) | 1993 (1987) | 1993 | 1993 |
| Germany | 1993 (1989) | 1993 (1989) | 1993 (1989) | 1993 (1989) | 1993 (1989) | 1993 (1989) | 1993 (1989) | 1993 (1989) | 1993 (1989) |
| Greece | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 |
| Ireland | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 |
| Italy | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) |
| Luxembourg | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 |
| Netherlands | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) |
| Portugal | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 | 1993 (note 2) |
| Spain | 1993 (1992) | 1993 (1992) | 1993 (1992) | 1993 (1992) | 1993 (1992) | 1993 (1992) | 1993 (1992) | 1993 (1992) | 1993 (1992) |
| United Kingdom BT | 1993 (1991) | 1993 (1987) | 1993 (1991) | 1993 (1991) | 1993 (1991) | 1993 (1991) | (note 3) | 1993 (1991) | 1993 (1991) |
| United Kingdom MCL | 1992 | 1992 (1988) | 1992 | 1992 | 1992 | 1992 | 1992 | 1992 | 1992 |

**TABLE 1 EURO-ISDN CORE SERVICE LAUNCH DATES**

*Notes:*
1. *The first date shown indicates the launch date for the Euro-ISDN service. Where a second date is given in brackets, that indicates the launch date for an earlier version of the service, conforming to other standards.*
2. *Terminal portability will not be available with 64-kb/s unrestricted bearer service in Portugal.*
3. *British Telecom has no immediate plans to support DDI on ISDN basic access.*

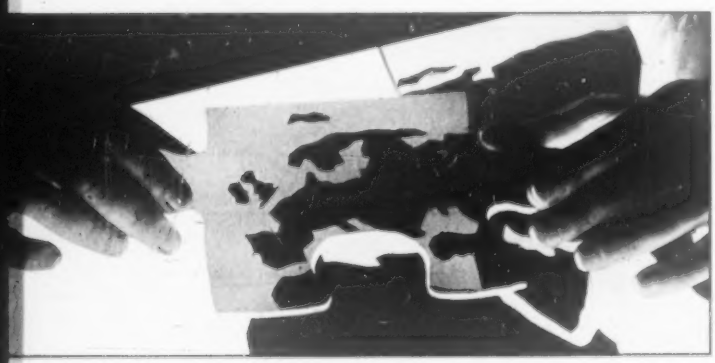
| | | January 1, 1991 | January 1, 1994 | January 1, 1997 | January 1, 2000 |
|---|---|---|---|---|---|
| Belgium | Primary | | 1 | 6 | 12 |
| | Basic | 1 | 1 | 35 | 167 |
| Denmark | Primary | | 1 | 3 | 7 |
| | Basic | | 2 | 60 | 195 |
| France | Primary | 1 | 5 | 18 | 66 |
| | Basic | 5 | 36 | 248 | 1706 |
| Germany | Primary | 1 | 5 | 21 | 83 |
| | Basic | 8 | 48 | 332 | 2318 |
| Greece | Primary | | | 1 | 8 |
| | Basic | | | 4 | 59 |
| Ireland | Primary | | | 1 | 3 |
| | Basic | | | 4 | 37 |
| Italy | Primary | | 1 | 17 | 36 |
| | Basic | | 3 | 136 | 1209 |
| Luxembourg | Primary | | | | 1 |
| | Basic | | | 2 | 9 |
| Netherlands | Primary | | 1 | 5 | 12 |
| | Basic | | 2 | 70 | 347 |
| Portugal | Primary | | | 3 | 10 |
| | Basic | | 1 | 13 | 110 |
| Spain | Primary | | 1 | 16 | 34 |
| | Basic | | 3 | 113 | 497 |
| UK | Primary | 2 | 12 | 32 | 88 |
| | Basic | | 24 | 154 | 979 |
| EC total | Primary | 3 | 26 | 123 | 360 |
| | Basic | 15 | 120 | 1171 | 7632 |

TABLE 2 PROJECTION OF ISDN ACCESS USAGE (THOUSANDS)

*All figures are rounded to the nearest 1000. A blank indicates a projection of fewer than 500.*
*The projections include both national standard and Euro-ISDN.*

lying momentum achieved by the technology, also are factors favoring market uptake. "ISDN is the only standardized technology today for digital communications," points out Baur. "We cannot supply digital systems in Europe, the U.S. or Japan that do not have ISDN capability."

Finally, the ISDN educational effort is picking up speed. As well as increasing public awareness



through national and international user forums, operators and manufacturers are participating in an increasing number of service and hardware demonstrations worldwide.

In one demonstration in mid-October, the *Daily Telegraph*, the U.K.'s most widely read broadsheet newspaper, remotely-made up full color pages over an international 384-kb/s ISDN link between London and Amsterdam. This demonstration used the System 2000 ISDN multiplexer, developed by the Australia company Datacraft, to aggregate six 64-kb/s channels.

The previous week at Telecom 91 in Geneva, ISDN products were exhibited in more than 60 booths, and most of the 70 different terminal adapters currently being sold in Europe were on display.

A major effort was made by Japanese companies at Telecom. NTT, for example, demonstrated an ISDN supervisory and testing module; an ISDN remote terminal; and terminal equipment such as videophones, a multipoint videoconference system, color and Group IV facsimile transceivers, and digital telephones.

Videophones, digital telephones and Group IV facsimile machines from 18 Japanese manufacturers also were interconnected through NTT's ISDN interface subscriber module. And, while some of these were only technology demonstrations, other products showcased already are on sale in Japan.

## ISDN Down the Road

But what about the future? At present, both demonstrations and working use of narrowband ISDN tend to concern rather straightforward applications such as file transfer from PC to PC, videoconferencing, Group IV facsimile exchange, high-quality sound and access to databases.

"Today, the major applications that represent the

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range of most client needs and, in practice, the most widespread usage, are relatively simple applications from a technical viewpoint and can be provided at low cost," argued Francoise Ravel, head of the switching and new telephony services department at the international networks division of France Telecom, at Telecom 91. "In other words, they require little specific hardware or software development and use, where possible, standard or commonly-used compatible terminals."

But more complex applications already exist or in the pipeline. In France, such applications often result from collaboration between France Telecom, end users and specialist software houses.

"The partnership approach has shown that services as diverse as remote access to documents, remote medical diagnosis from echographic images or remote video supervision can be widely used in the relevant professional environments," said Ravel.

For such applications to be developed on an international basis, a number of outstanding equipment compatibility and interfacing issues must be settled, he warned.

While they are being settled, competitors for some of the "natural" narrowband ISDN market constituency are appearing on the horizon. As previously noted, present day bandwidth-on-demand is one, and future fast packet switching and broadband ISDN are others.

In fact, dial-up, pay-by-use services involving aggregates of multiple 64-kb/s channels already are available with narrowband ISDN. In addition to the Australian technology used in the *Daily Telegraph* demonstration, a subsidiary of Swedish Telecom has developed an ISDN terminal that combines and synchronizes several 64-kb/s channels to form higher order channels at, for example, 384 kb/s or 2 Mb/s. In Sweden, such terminals are connected to a service called IDN 340,000.

The success of fast packet switching systems such as frame relay will depend on the service quality and tariffs offered by service providers, although it is possible to view frame relay as a starting point on the way to true broadband ISDN using technology such as asynchronous transfer mode (ATM) switching.

ATM also was much in evidence at Telecom 91, where demonstrations included a joint presentation from Ericsson and IBM.

All major league international telecom players have ATM prototypes, pre-commercial implementations or plans for the technology. Fujitsu, which already has an ATM product portfolio, recently tested a module with a switching capacity of 40 Gb/s and is developing even faster technology.

Alcatel, whose switches established France Telecom's pioneering Numeris ISDN service, is planning a return to the U.S. CO market—currently the world's biggest user of narrowband ISDN—via ATM technology.

The company has begun discussing its plans with major local exchange carriers in the United States and expects to stage a full ATM trial in 1992, according to Larry Hulbert, vice president-sales, service and technical marketing for Alcatel Network Systems.

"We expect the U.S. market will be ready for full deployment of ATM to begin in 1994 or 1995," says Hulbert. "We would expect to deploy a significant amount of ATM [switches] by then."

A common aspiration of vendors is to assemble a portfolio of technology and systems capable of matching present market demands and having the evolutionary potential to meet future requirements.

Vision O.N.E. is the Siemens/GPT way to hedge this particular bet. "The multinationals are going to drive ISDN. Whether it's narrowband or broadband is hard to say," suggests Tony Cobbe, group marketing director of GPT's telecommunications systems group.

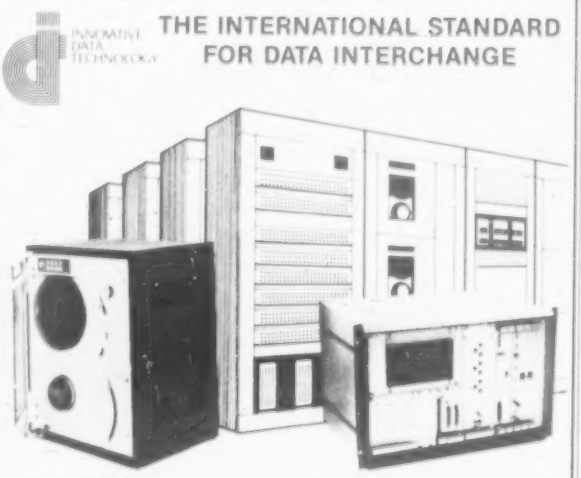
Set against the "too little, too late" interpretation of narrowband ISDN are a number of unresolved issues for its would-be broadband successor. As yet there is no evidence that widespread terminal availability, application development or international interconnection and standardization will be easier to achieve for broadband ISDN than was the case with narrowband.

Broadband tariffs, too, present something of a conundrum: The technology offers channel capacities several thousand times larger than today's systems, but obviously no one will accept price hikes of the same magnitude for using ATM networks.

Finally, there is a distinct possibility that high- and low-rate systems will co-exist. As Baur puts it: "We cannot assume that broadband ISDN will replace ISDN—rather that it will supplement it." ■

INNOVATIVE DATA TECHNOLOGY

**THE INTERNATIONAL STANDARD FOR DATA INTERCHANGE**



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